RESEARCH

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FAILURE OF SURFACE COURSES BENEATH PAVEMENT MARKINGS

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March 2010

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16. Abstract

Pavement markings can contribute to the deterioration of surface courses and in some cases it was found that the markings are the main source of distress. The reasons for such damage are outside the scope of this work but it was speculated that water vapor trapped under the pavement marking can lead to moisture damage and raveling in this high voids mixtures. A change in gradation which was implemented in 2008 should help with this condition by increasing the binder content and reducing the voids. Furthermore, as of 2008, UDOT has discontinued the use of OGSC. Other surface treatments (slurry seals, SMA's, etc.) might prove to be more durable and less susceptible to the type of distresses observed as part of this work. However, careful selection of the right treatment for the right condition along with proper controls during production, placement, and compaction of surface mixtures is still needed to obtain longer lasting pavement surfaces.

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EXECUTIVE SUMMARY

Thirteen pavements were evaluated as part of this work to determine if failures in the surface course occurred underneath pavement markings. No laboratory experimentation was performed, but a detailed evaluation was done on each road and the distresses were documented following the procedures developed as part of the Long Term Pavement Performance Program (LTPP).

Based on the evaluation of the roads, it seems that there are cases were the paint marking were significant contributors to the deterioration of the road surface (SR-190, SR-209, and SR 224). At the same time there were some cases were the influence of the paint marking was not clear or was consistent with the distresses observed along the rest of the road (SR-36, SR-48, and Provo Canyon Road). There were also cases where it was clear that the paint marking did not contribute to the distresses observed (SR-71, SR-89, and SR-186).

It was concluded that paint markings can contribute to the deterioration of surface courses, although other factors such as construction joints can also lead to surface failures. The reasons for such damage are outside the scope of this work but it was speculated that water vapor trapped under the paint marking can lead to moisture damage and raveling. A change in gradation which was implemented in 2008 should help with this condition. Furthermore, as of 2008, UDOT has discontinued the use of OGSC. Other surface treatments (slurry seals, SMA's, etc.) might prove to be more durable and less susceptible to the type of distresses observed as part of this work. However, careful selection of the right treatment for the right condition along with proper controls during production, placement, and compaction of surface mixtures is still needed to obtain longer lasting pavement surfaces.

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1.0 INTRODUCTION

Field maintenance operation records have shown some evidence that the durability of surface courses seems to be affected by the presence of pavement markings. The surface course will de-bond where the paint marking is located accelerating the damage on the road. This form of distress, while not formally documented, has been reported on both tape and paint stripes and occurs on messages, lane lines, hatches in the median, etc.

As an example, figure 1 shows pictures taken during the Spring of 2009 on Van Winkle Expressway in Salt Lake City, in which damage is observed almost exclusively on the markings. At the time of these pictures, the road was 7 years old and the marking was tape.

a) Damage observed on the lane markings

b) Close up of damage

c) Distresses shown almost exclusively along the marking

d) Damage not limited to stripes.

Figure 1: Deterioration under tape markings in Van Winkle Expressway **The markings used on the pavement shown in figure 1 are tape. However, as shown in figure 2, this type of damage has also been observed on water based paints.**

a) Damage shown on the lane markings

b) Distress shown almost exclusively on the markings

c) Close up of damage

d) Close up of damage

Figure 2: Damage on water based pavement markings observed along I-15 near Santaquin

There are several hypotheses to explain this accelerated damage. One hypothesis is that moisture vapor gets trapped under the marking possibly leading to an emulsification and de-bonding of the asphalt binder from the aggregate. The result of this process is potholes or raveling along the road. A second hypothesis is that the difference in reflectivity (albedo) between the pavement surface and the marking leads to differential strains that result in development of flaws. These flaws eventually coalesce leading to pavement deterioration in the form of longitudinal cracks. Of course, it is possible that both processes lead to accelerated damage.

If indeed the pavement markings contribute to the acceleration of the damage on surface course treatments, then the reasons for the accelerated distress need to be understood and a solution needs to be developed. The first step is, of course, to document the magnitude of the problem before more extensive solutions are proposed.

2.0 LITERATURE REVIEW

Accelerated damage of pavement surfaces is the results of many factors both related to traffic and the environment. Specifically, the effect of moisture has been thoroughly documented since before the 1970's when Lottman published results from his laboratory investigation [1]. More recently, researchers have evaluated the damage caused by moisture on mixtures with varying asphalt film thickness, air voids, and permeability. Researchers have concluded that low asphalt content, high air voids (>7%), and high permeability (>10^{-2} cm/s) can lead to rapid deterioration [2, 3, 4]. The damage caused by moisture has lead many highway agencies to adopt tests that specifically target this type of distress [5, 6] and to require anti-striping agents such as lime, etc. In the case of Utah Department of Transportation (UDOT), its Manual of Instruction (MOI) requires the addition of hydrated lime on their mixes (Section 906.04). These requirements are for structural mixes, not necessarily surface mixtures. Open graded surface mixtures (OGSM) are covered under a different section of the MOI (chapter 8 section 954).

The study of moisture damage on surface-type mixtures is slightly more complicated since they are usually only a few inches thick or less, making it difficult to obtain samples for laboratory testing. With shrinking maintenance budgets, the desire to extend the life of surface mixtures has lead to interest in adhesion and cohesion of asphalt to aggregates in the presence of water [3, 7]. However, this research is still in its early stages and standard methods have not been adopted by any highway agency.

No references were found that specifically mention damage of surface mixtures under pavement markings. However, there are multiple references regarding the effect of moisture trapping under construction materials caused by sealant paints, etc. [8, 9]. Straube [9] states that for a moisture-related problem to occur, it is necessary for at least four conditions to be satisfied: 1- A moisture source must be available, 2- there must be a route or means for this moisture to travel, 3- there must be some driving force to cause moisture movement, and 4- the materials involved must be susceptible to moisture damage. All four conditions are common on surface course mixtures.

Some studies have been conducted regarding the albedo in asphalt pavements, mostly in relation to the 'heat island effect.' One study shows that, under certain paint pigments used in their research, the paint-coated asphalt pavement showed about 15 ºC lower surface temperature than that of the conventional material at the maximum temperature [10]. Unfortunately, no mechanical tests have been performed as part of such studies so it is not known if the strains resulting from this effect are large enough to create cracks on the pavement surface.

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3.0 RESEARCH OBJECTIVE

The objective of this research is to quantify the extent of failures of surface courses caused or accelerated by pavement markings. This will be achieved by evaluating the condition of existing pavements only, not through laboratory experimentation. At present, most of the information has been anecdotal; therefore, a systematic documentation of the extent of the problem will lead to better understanding and to the development of possible strategies that can be implemented to address this problem.

Addressing a poorly understood problem and developing a sound strategy to reduce premature deterioration of surface courses caused by pavement markings will lead to significant savings in terms of both funds and resources to the Department and will provide a more durable road surface for the traveling public; ultimately, this is the objective of this research effort.

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4.0 PROCEDURES

In order to accomplish the research objectives, a meeting was held between the research team and the Technical Advisory Committee. During the meeting, different hypothesis were discussed. It was decided that the best approach would be to evaluate a sampling of road sections in which the existing surface treatment was 6 or more years old. If the majority of these sections showed that failure occurred predominantly around the paint markings and not over a more extensive section, then it would be logical to conclude that paint markings themselves have an effect in the deterioration of the road surface. On the other hand, if the observed failures extend beyond the markings, it would be logical to conclude that other mechanisms are in place besides the pavement marking. Once the extent of the problem has been documented, changes in the design or application of surface course can be recommended.

A request was sent to all Regional Maintenance staff to help identify possible pavement sections that might meet the requirements of this research. Table 1 shows a list of those sections identified for this work. Most of the sections were from UDOT Region 2.

Table 1 Projects Evaluated

Route	Location	Installation Year
SR 36	Tooele Main Street MP 48-55	2001
SR 48	7200 South 700 west to State street	2002
SR 48	7800 South from Copper Hills High School to Bangerter Highway	2002
SR 71	7th east from 9400 south to 9800 south	2003
SR 71	7th east from 10200 south to 10500 south	2003
I-80	Lambs Canyon to Kimballs Junction	2003
SR 89	State street 900 South to 3300 South	2001
SR 186	Foothill blvd. from 1300 east to I-80	2002
SR 190	6200 south from Wasatch blvd. to mouth of Big Cottonwood Canyon	2000
SR 209	9400 south from 2200 east to the mouth of Little Cottonwood Canyon	2001
SR 224	from Bear Hollow Dr. to the Junction of SR 248 Park City area	2003
I-215	from 700 west to 1440 west (west side belt)	2003
Provo	Provo Canyon between MP 19 - 21	Unknown

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5.0 RESULTS

A total of 13 sections were identified and evaluated for this research. A member of the research team visited each of the sections during the summer of 2009 and evaluated the condition of the road based on visual distresses following the procedures and forms developed as part of the Long Term Pavement Performance (LTPP) Distress Surveys [11]. Detail distress mapping was done on most sections along with photographs. However, for safety reasons, only a drive-by was done on section with high traffic volume and no sidewalk such as the interstate sections (I-80, and I-215). No photographs were taken on these section either.

SR – 36

SR 36 is the Main Street in Tooele. It was observed that the majority of the damage is due to moderate to severe transverse cracking. The transverse cracking is not isolated to the paint marking areas as it extends the entire width of the road. On the northbound lane there is longitudinal cracking considered severe in some areas. Most of the cracks are located along the white marking separating the road from the shoulder. In general the paint markings are worn and faded.

(a) longitudinal and transverse cracking

(b) faded paint markings along with surface deterioration

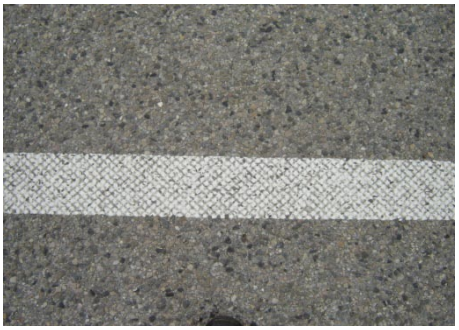
(c) transverse crack extending through the paint marking

(d) longitudinal cracking along the paint marking on the northbound lane

Figure 3: Pictures from SR - 36

SR – 48 (7200 South and State Street)

This portion of SR 48 (7200 South) was evaluated from 700 West to State Street. Both the eastbound and westbound lanes were evaluated. In general, the road appears to be new. The paint also appears to be new. The damage observed consists of sporadic, low grade longitudinal cracks probably due to seam over lap during the construction process.



(a) fairly new surface and markings

(b) faded paint markings but no visible distresses (EB Lane)

(c) transverse crack extending through the paint marking (WB Lane)

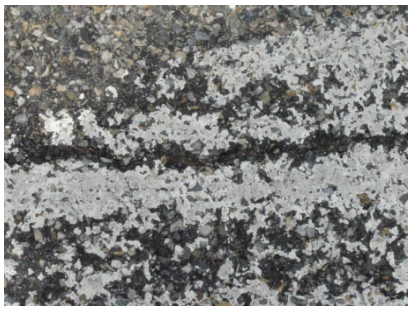
(d) center marking showing some join deterioration.

Figure 4: Pictures from SR 48 7200 South

SR – 48 (7800 South and Bangerter)

This portion of SR – 48 (7800 South) was evaluated from Copper Hills High School to Bangerter Highway. The majority of the damage consists of moderate transverse cracking extending into the shoulder. The road was re-striped and there are portions of moderate to severe longitudinal cracking mostly isolated to the area were the old paint marking was located. There is sporadic raveling on the eastbound lane along the cracks and the wheelpath. While the new paint shows no signs of distresses, it is clear that the old paint might have contributed to the longitudinal cracking.

(a) raveling observed on the shoulder. Note old markings on the road.



(b) raveling in area near the old paint marking

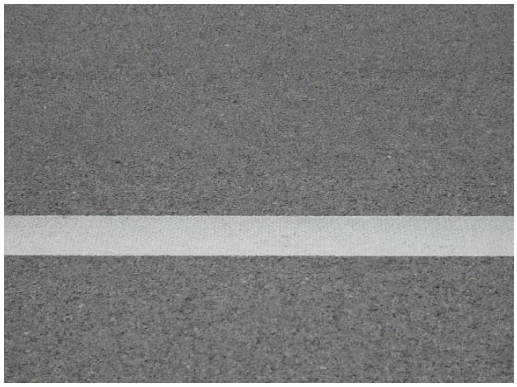
(c) new markings showing no visible distresses.

(d) Transverse crack

Figure 5: Pictures from SR 48 7800 South

SR – 71 (7th East and 9400 South)

This portion of 7th East was evaluated from 9400 South to 9800 South. The road appears to have been recently resurfaced. Paint is in good shape and there are no signs of distress. .



(a) No sign of distress observed

(b) New surface appears to be in good shape

Figure 6: Pictures from SR 71 and 9400 South

SR-71 (7th East and 10200 South)

A second segment of SR 71was also evaluated from 10200 South to 10500 South. On the southbound lane, the evaluation showed that the majority of the damage is due to medium severity longitudinal cracking with some raveling present. The damage did not seem to be isolated to the paint. There is also significant damage due to medium severity transverse cracking mostly occurring between the outside paint stripe and the shoulder.

In the northbound lane there is substantial fatigue cracking. As would be expected, the damage appears to be isolated mostly to the wheelpath. The paint shows normal wear and did not contribute to the distress. As with the southbound lane, there is some medium to severe transverse cracking mostly concentrated in the center of the road.

(a) Longitudinal cracking along the middle of the road

(b) Typical longitudinal crack with minor raveling

(c) Longitudinal and possibly fatigue cracks along the wheelpath

(d) Transverse crack showing the paint stripe being in good shape.

Figure 7: Pictures from SR 70 and 10200 South

Interstate – 80

Interstate 80 was evaluated from Lambs Canyon to Kimballs' Junction. This road appears to have been recently resurfaced and no significant distresses were noted. For safety reason only a drive-by evaluation was performed and no pictures were taken.

SR – 89 (State Street)

State Street was evaluated from 900 South to 3300 South. It was observed that the majority of the damage was from 3000 South to 3300 South in both the north- and southbound lanes. Most of the damage consists of moderate to high longitudinal cracking. In some cases the cracks have been sealed, but in other cases there is moderate raveling and occasional small potholes. The longitudinal cracks occur predominantly near the construction joint and are independent of the paint stripes. There is also some moderate to high transverse cracking.

(a) Cracking and sealing along the construction joint

(b) Longitudinal crack showing signs of raveling

(c) Initiation of a pothole

(d) Transverse crack

Figure 8: Pictures from State Street and 3300 South

SR – 186

This road is Foothill Boulevard. It was evaluated from 1300 East to the entrance ramp to I-80. The majority of the observed damage was moderate to severe longitudinal cracking with some raveling. The longitudinal cracks appear mostly at the construction joints and are not related to the paint stripe. There is also sporadic low to medium fatigue cracking in the outside wheel path especially on the northbound lane. There is low to moderate transverse cracking observed at regular intervals. The paint does not seem to have an effect on the distresses.

(a) Severe longitudinal crack at the joint

(b) Fatigue cracking observed on the wheelpath

(c) Combination of longitudinal and transverse cracking.

(d) Transverse crack seen at regular intervals

Figure 9: Pictures from Foothill Blvd.

SR – 190

This road was evaluated from Wasatch Boulevard to the mouth of Big Cottonwood Canyon. In this road most of the damage was observed underneath the paint markings. There is significant raveling on the outside paint marking and moderate to severe longitudinal cracking, also along the paint stripe. The severe raveling has lead to large potholes and areas where the top surface has delaminated from the road structure. There is significant wear on the road surface.

(a) Significant raveling is observed underneath the paint marking

(b) Area were the raveling has lead to a large pothole

(c) Longitudinal crack

(d) Deterioration underneath the paint marking

Figure 10: Pictures from SR 190

SR – 209

SR-209 is 9400 South and was evaluated from 2200 East to the mouth of Little Cottonwood Canyon. The majority of the observed damage was raveling that occurred almost exclusively underneath the paint marking. Some of this raveling has lead to potholes. In addition, there is also a fair amount of moderate to severe transverse cracking, probably caused by either reflective cracking or thermal cracking. In some places the paint is so worn out that it is non-existing.

(a) Severe raveling appears along the paint marking

(b) Longitudinal cracking along a worn out paint marking

(c) Pothole resulting from the raveling also along the paint marking

(d) Almost faded paint marking

Figure 11: Pictures from SR 209

SR – 224

This road was evaluated from Bear Hollow Drive to the junction of SR 248 in Park City. Most of the damage was observed consists of moderate to severe longitudinal cracking with some raveling. The damage seems to be concentrated along the paint marking although in some cases the cracking seems to be the result of a construction joint. There are also signs of low severity fatigue cracking along the wheelpath with some transverse cracking also present.

Interstate -215

This road showed no signs of any major distress. The road appeared to have been resurfaced within a year or so. No pictures were taken due to safety reasons.

(a) Longitudinal crack and raveling observed along the paint marking

(b) Transverse crack along with worn out paint stripe

(c) Severe raveling and cracking observed along the paint marking

(d) Longitudinal crack along a construction joint

Figure 12: Pictures from SR 224

Provo Canyon Road

Provo Canyon Road was evaluated from MP 19 to MP 21. The road narrows to one lane in each direction. Most of the damage consists of moderate to severe longitudinal and transverse cracking. In addition there are large areas of moderate fatigue cracking. Raveling is also present and appears to be worse where the paint marking is present; especially where the old paint was before the road was widened.

(a) Moderate fatigue cracking

(b) Raveling underneath the paint marking. Note presence of old marking

(c) Longitudinal crack along the paint stripe

(d) Raveling

Figure 13: Pictures from Provo Canyon Road

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6.0 ANALYSIS

Based on the evaluation of the roads, it seems that there are cases where it was clear that the pavement marking were significant contributors to the deterioration of the road surface (SR-190, SR-209, and SR 224 along with Van Winkle and I-15). At the same time, there were some cases were the influence of the pavement marking was present but not exclusive, or was consistent with the distresses observed along the rest of the road (SR-36, SR-48, and Provo Canyon Road). There were also cases where it was clear that the paint marking did not contribute to the distresses observed (SR-71, SR-89, and SR-186).

The reason why such varying behavior was observed would not be known without further forensic analysis which is outside the scope of this work. Furthermore, as previously stated, it is possible that more than one condition is responsible for such distresses. Nevertheless, it is clear that in 8 out of 11 sections evaluated the pavement marking was a contributor to the deterioration of the road surface. There is also a good possibility that sections where the distresses were severe have already been resurfaced. It is worth noting that the sections evaluated were between 6 and 8 years old. Most research has indicated that surface treatments last 7 to 10 years, thus some of the failures are expected even if there were accelerated by paint markings.

6.1 Gradation Requirements

The surface of the roads evaluated is a treatment classified as Open Graded Surface Courses (OGSC). For many years, OGSC were commonly placed on road surfaces around the State of Utah; however, since the time the treatments were applied on the roads evaluated, several changes have occurred in UDOT's policy. The first change consisted in different gradation requirements for OGSC. The 2008 specifications for OGSC specify the following gradation requirements.

Table 2: 2008 Gradation Requirements for OGSC

Aggregate Gradation	
Percent Passing by Dry Weight of Aggregate	
Sieve Size	Percent
½ inch	100
□ inch	90 - 100
# 4	35 - 45
# 8	14 - 20
# 200	2 - 4

If the requirements in place at the time of construction of the sections evaluated are compared with the 2008 requirements, it is evident that the older gradation requirement resulted in a more 'open' mixture with lower binder content. As describe in the literature review, such mixture is

more susceptible to moisture damage, raveling, and even cracking. By producing a mixture with higher density and higher asphalt binder content, there is less chance of water vapor migrating to areas under the paint marking and initiating the distresses observed through this investigation.

The second, and most significant, change in UDOT's policy occurred later in 2008 where it was determined that: "OGSC is not the preferred pavement treatment given the current state of funding and the economic situation." This change has hopefully resulted in alternative surface treatments that are less susceptible do damage underneath the paint marking. However, given that this change is only 2 years old, it is too soon to know of any benefits.

6.2 Construction Issues

One issue that was noted as part of this work is that some failures seem to initiate at the construction joint. It is well documented that construction joints pose a challenge in terms of achieving the target density, thus special attention should be placed to joints.

7.0 SUMMARY AND CONCLUSIONS

This work evaluated 13 pavement sections to determine if pavement markings were responsible for failures observed in surface courses. Based on the observations, it was determined that some of the distresses observed do occur underneath the pavement markings. In 8 out of 11 (73%) pavements showing distresses, the marking was a contributor to the overall distress condition of the road. It is believed that water vapor condenses underneath the paint leading to moisture damage which is reflected as raveling and debonding of the surface course. It is also believe that the paint marking leads to stresses where cracks can initiate. Unfortunately, extensive laboratory experimentation needs to be done to corroborate such theories.

The changes in UDOT's specifications have nearly eliminated Open Graded Surface Courses as an alternative in pavement preservation treatments. Other surface treatments (slurry seals, SMA's, etc.) might prove to be more durable and less susceptible to the type of distresses observed as part of this work. However, careful selection of the right treatment for the right condition along with proper controls during production, placement, and compaction of surface mixtures is still needed to obtain longer lasting pavement surfaces.

It is recommended that any surface mixture selected as part of the maintenance program be evaluated in terms for potential factors for accelerated moisture damage. It is also recommended that the condition of surface treatments be well documented for future reference and that changes be justified based on unbiased performance data.

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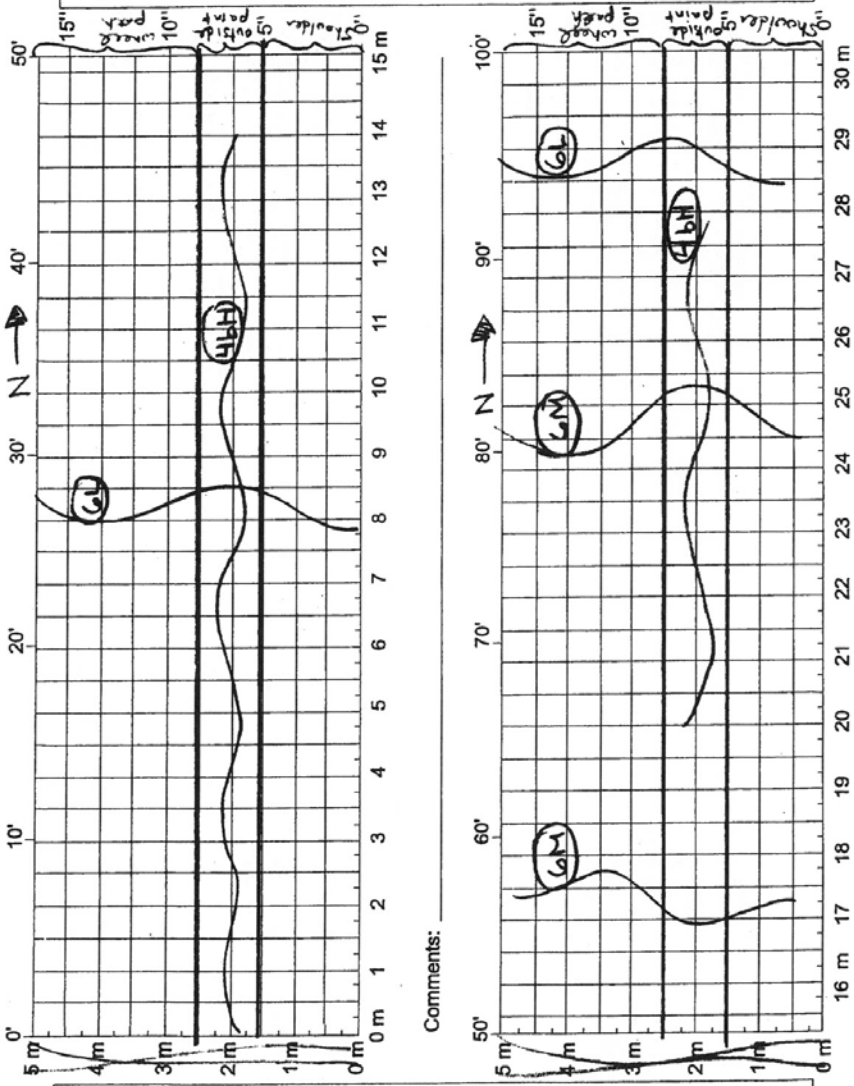
APPENDIX I - FIELD DISTRESS EVALUATIONS

Reviewer: _____ Surveyors: _____ Pavement Temp:

Date: 5/28/09 Date: _____ Before _____ After _____

Sheet Summary

SR 36 Tooele Main Street North Bound MP 48-55. A majority of the damage is due to longitudinal cracking that is severe-moderate. In addition there is a good portion of transverse cracking that is moderate-severe that encompasses the entire width of the road. Paint is worn & faded.



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Section Summary

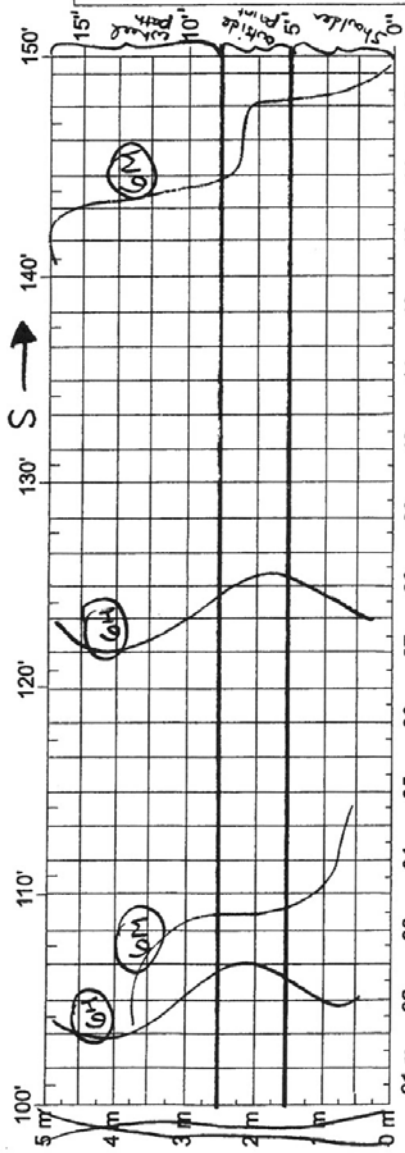
108 Appendix A

Reviewer: _____ Surveyors: _____

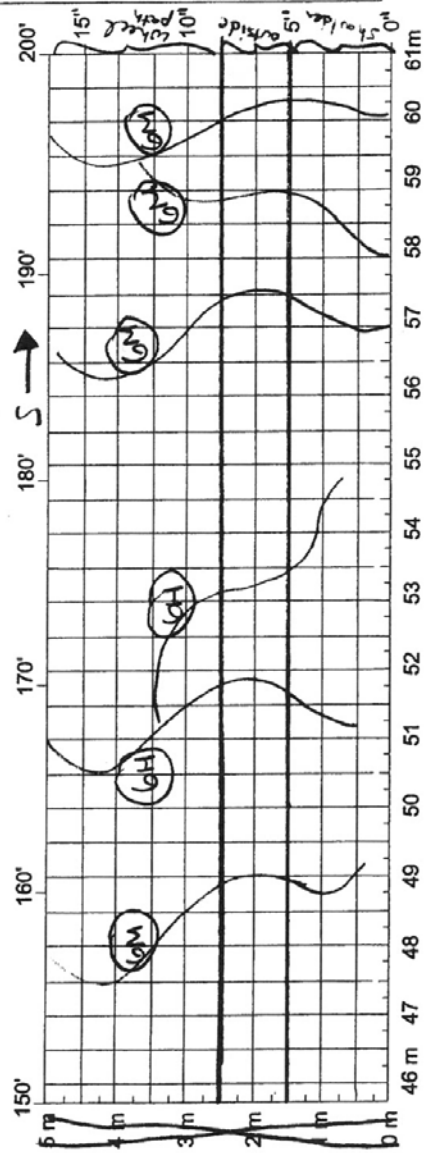
Date: 5/28/09 Date: _____

Sheet Summary

SR 36 Tooele Main Street SouthBound from MP48-55. The majority of the damage is due to moderate-severe transverse cracking that is not localized to the paint. Transverse cracking effects the entire width of the road. The paint is worn & faded.



Comments: _____



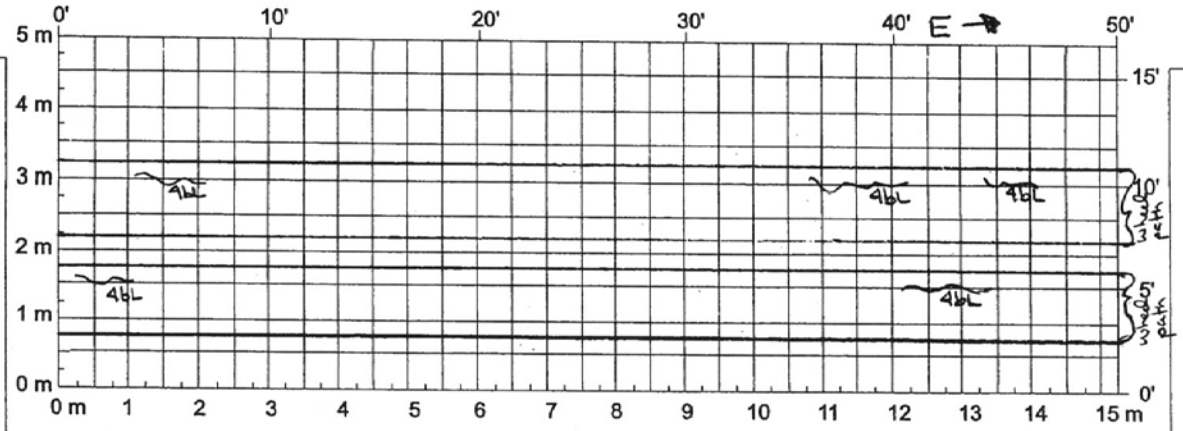
Comments: _____

Reviewer: _____ Surveyors: _____ Pavement Temp:

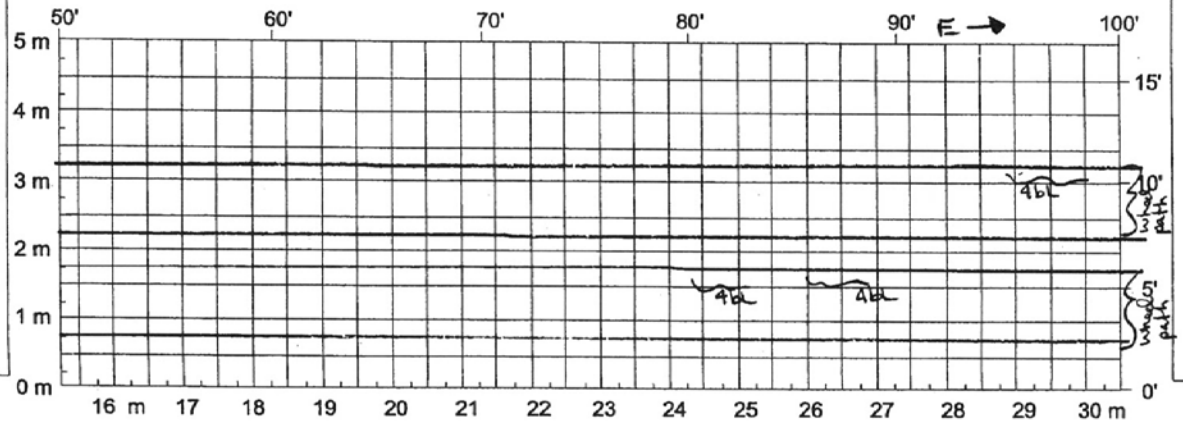
Date: 06/12/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: 7200 South from 700 West to State Street East Bound



Comments: _____

Sheet Summary

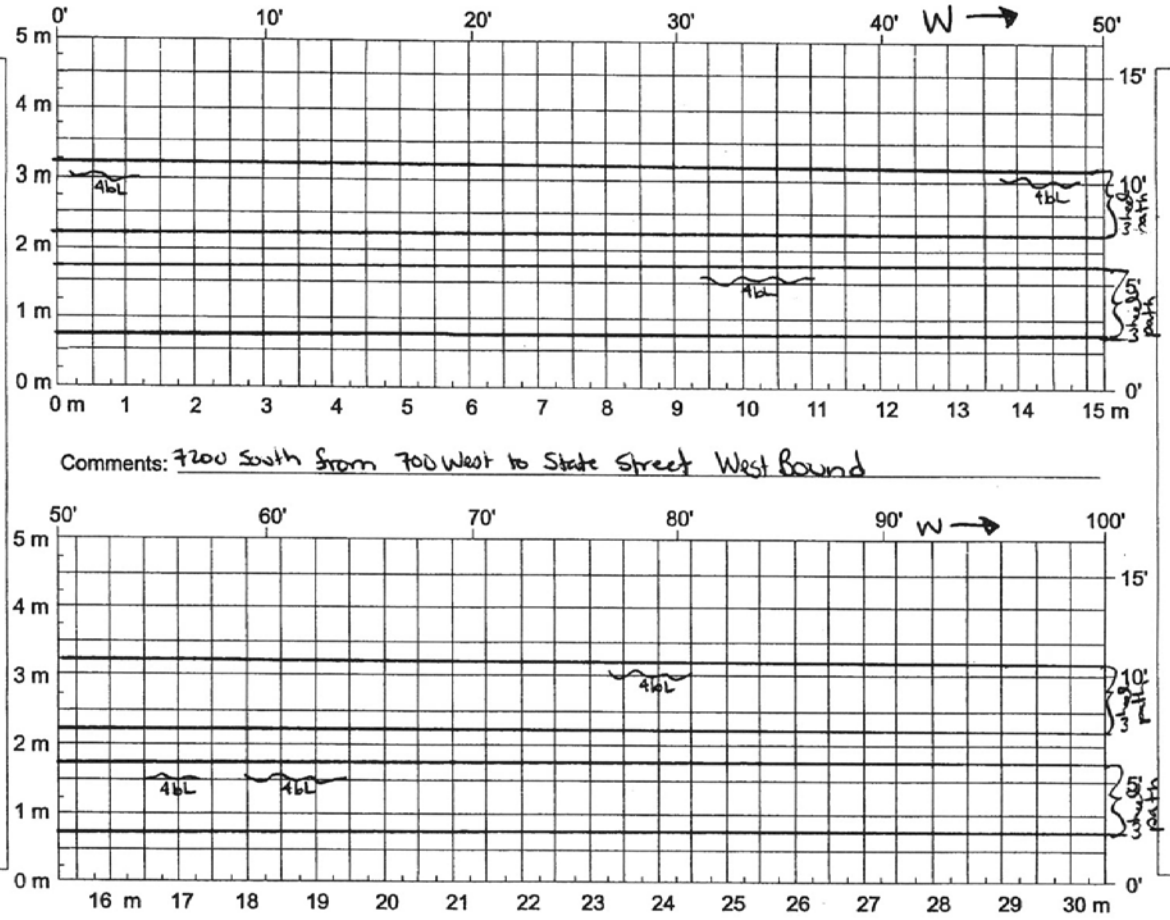
7200 South from 700 West to State Street East Bound. Road appears to be newer. The paint appears to be new. The damage present has consists of sporadic low grade longitudinal cracks that appear to be due to seam over lap.

Reviewer: _____ Surveyors: _____ Pavement Temp:

Date: 06/12/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: 7200 South from 700 West to State Street West Bound

Comments: _____

Sheet Summary

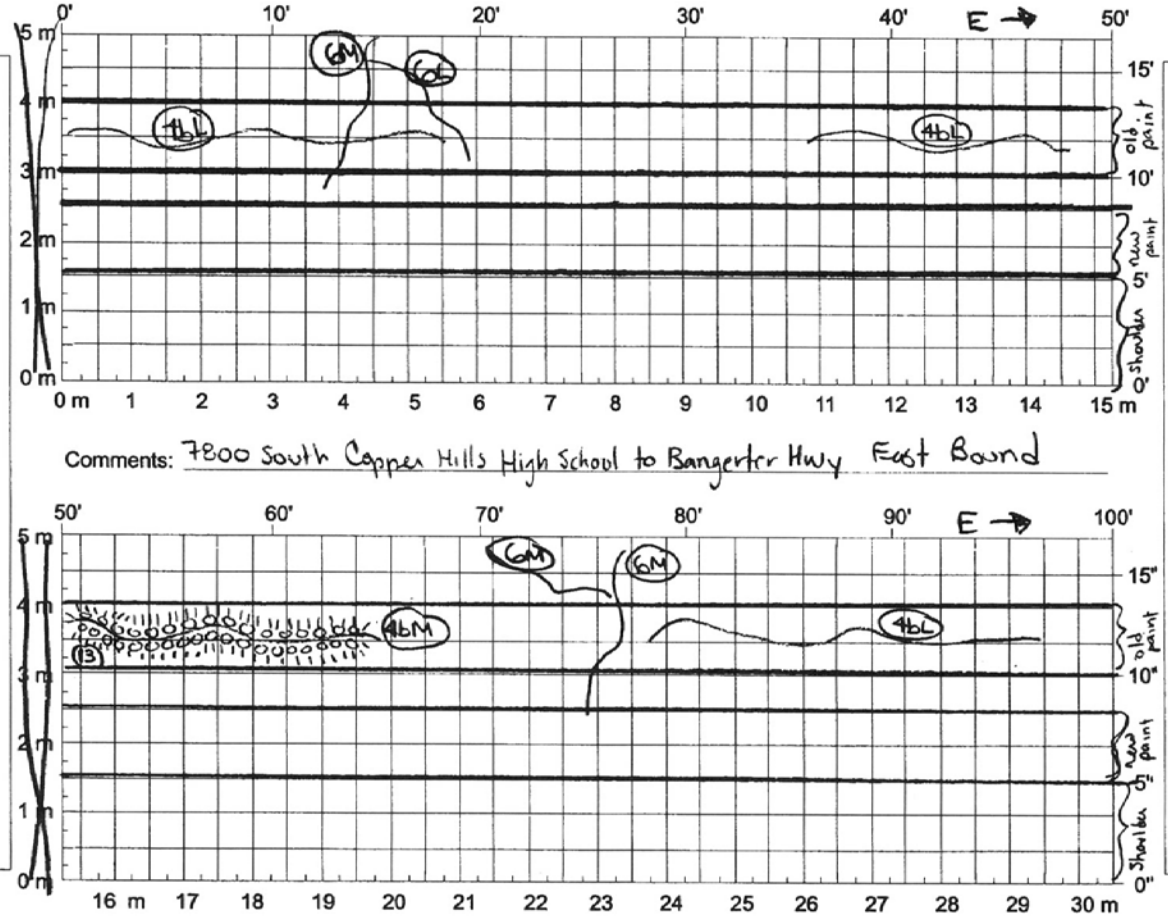
7200 South from 700 West to State Street West Bound. Both the paint & road appear new. The damage that is present appears isolated to the areas where the seams overlap & consists of low grade longitudinal cracking.

Reviewer: _____ Surveyors: CB Pavement Temp:

Date: _____ Date: 6/12/09 Before_____ After_____

Section Summary

108 Appendix A



Comments: 7800 South Copper Hills High School to Bangerter Hwy East Bound

Comments: _____

Sheet Summary

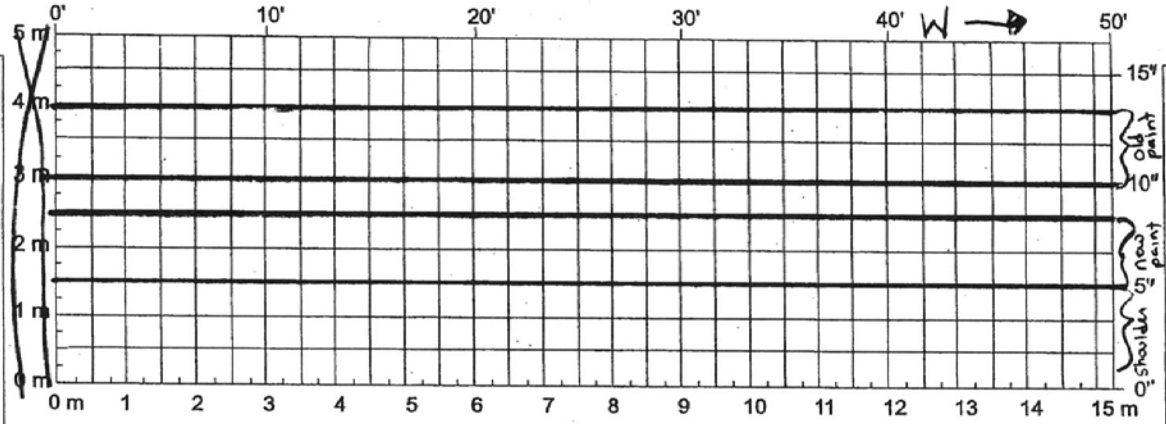
7800 South Copper Hills High School to Bangerter Hwy, East Bound. A majority of the damage is in the wheel path & consists of moderate to severe transverse cracking. The old paint shows low levels of longitudinal cracking with sporadic raveling.

Reviewer: _____ Surveyors: CB Pavement Temp:

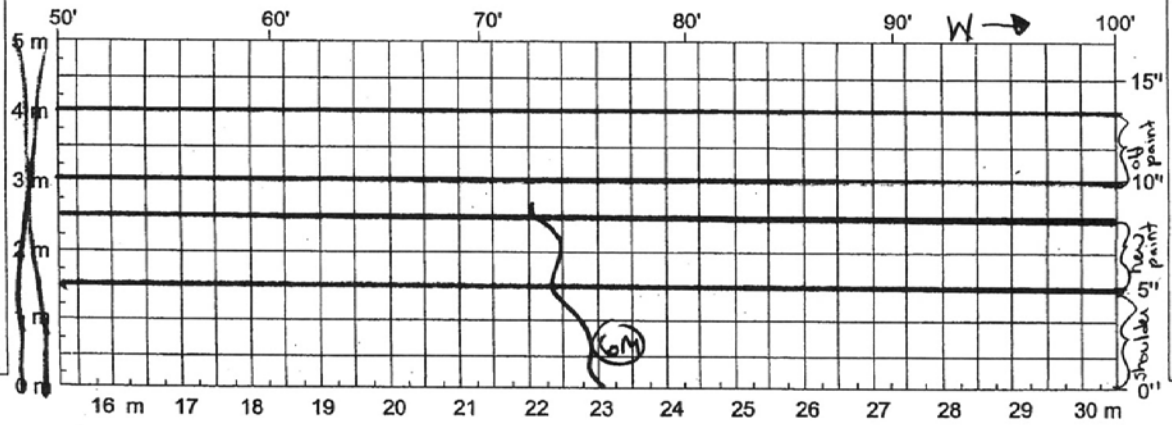
Date: _____ Date: 6/12/09 Before _____ After _____

Section Summary

108 Appendix A



Comments: 7800 South Copper Hills High School to Bangerter Hwy West Bound



Comments: _____

Sheet Summary

7800 South Copper Hills High School to Bangerter Hwy, WestBound. A majority of the damage consists of moderate to severe longitudinal cracking that is mostly isolated to the old paint. There is also a fair amount of low moderate transverse cracking that is mostly isolated between the final & shoulder. There is raveling present on & off through out the longitudinal cracks.

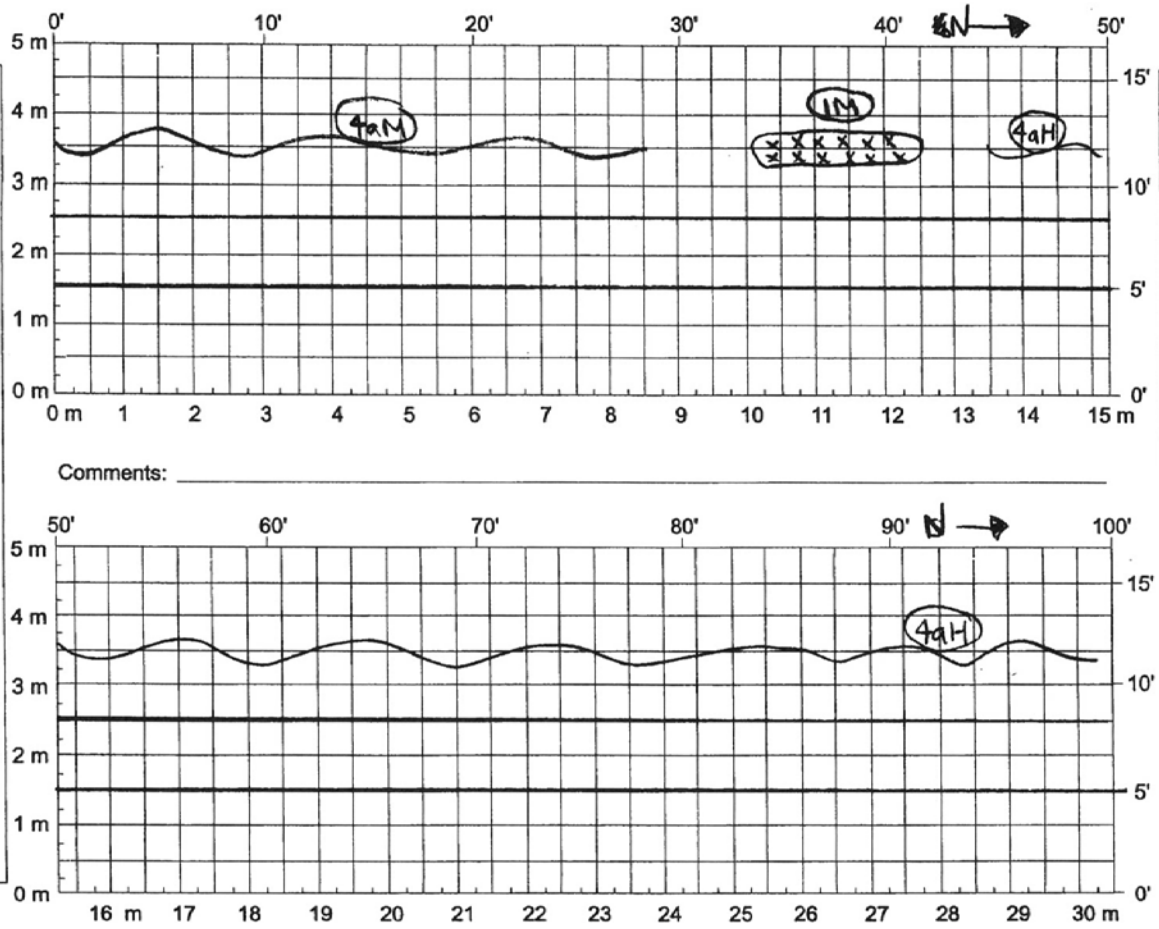
Reviewer: _____ Surveyors: _____ Pavement Temp:

Date: 06/15/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A

700 East from 10200 South to 10500 South



Comments: _____

Comments: _____

Sheet Summary

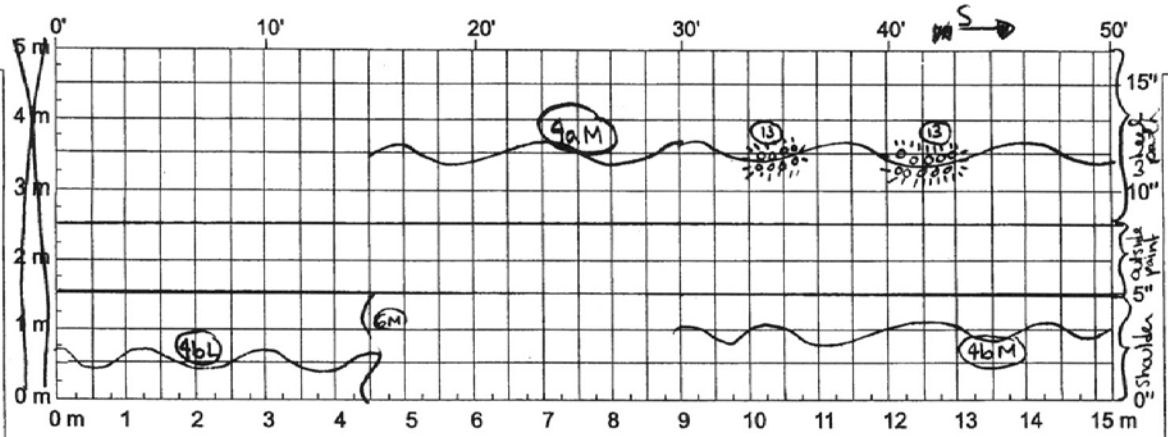
700 East from 10200 South to 10500 South northbound. A Majority of the damage consists of mod-severe longitudinal cracks. There is also substantial fatigue cracking. The damage appears to be isolated mostly to the shoulder & the wheelpath. The paint shows normal wear. There is occasional medium to severe transverse cracking that mostly appears in the center of the road.

Reviewer: _____ Surveyors: _____ Pavement Temp:

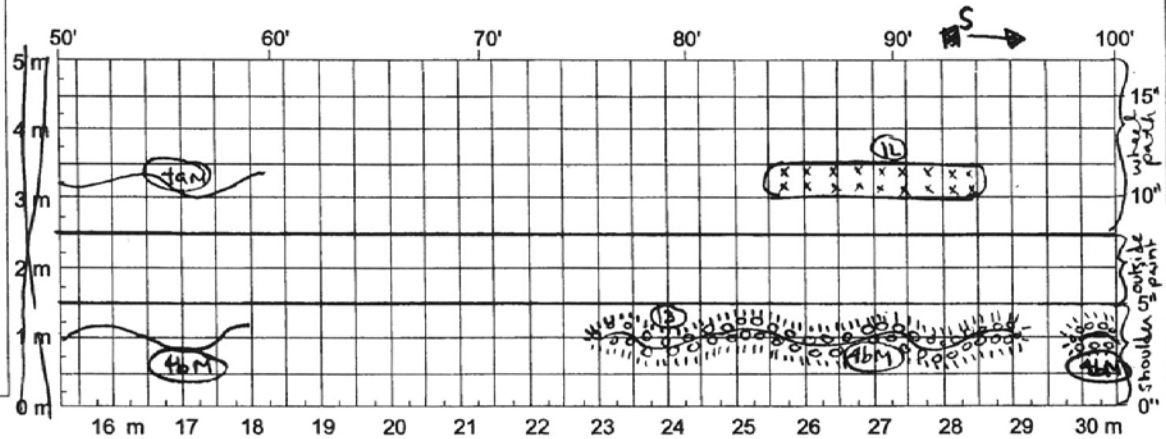
Date: 06/15/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: _____



Comments: _____

Sheet Summary

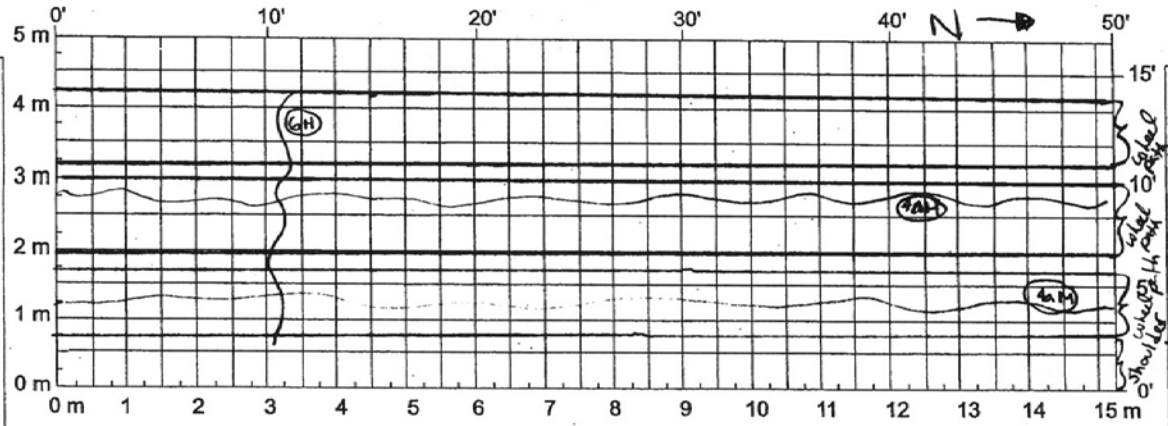
700 East from 10200 South to 10500 South Southbound lanes), A majority of the damage is due to med-severe longitudinal cracking with raveling present. The damage is not isolated to the paint. There is also significant damage due to med-severe transverse cracking mostly occuring between the outside paint & the shoulder.

Reviewer: _____ Surveyors: OB Pavement Temp:

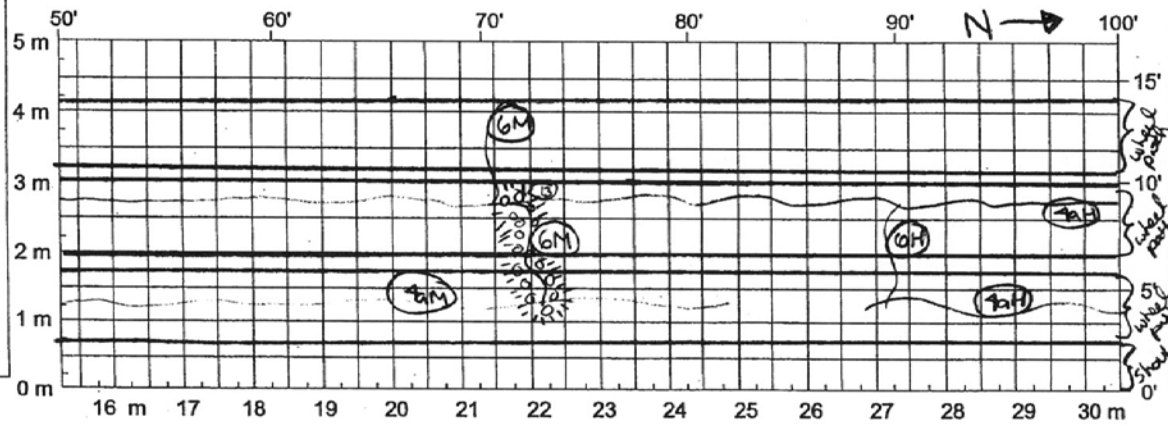
Date: _____ Date: 07/06/09 Before_____ After_____

Section Summary

108 Appendix A



Comments: State Street Northbound 3000 South to 3300 South



Comments: _____

Sheet Summary

State Street 900 South to 3300 South Northbound. A majority of the damage present is from 3000 South to 3300 South. The damage present consists mostly of moderate to high longitudinal cracking with moderate raveling & occassional small pot holes. There is also moderate to high transverse cracking that is mostly present in travel lanes. A majority of the longitudinal cracks occur where the seams overlap

Sheet Summary

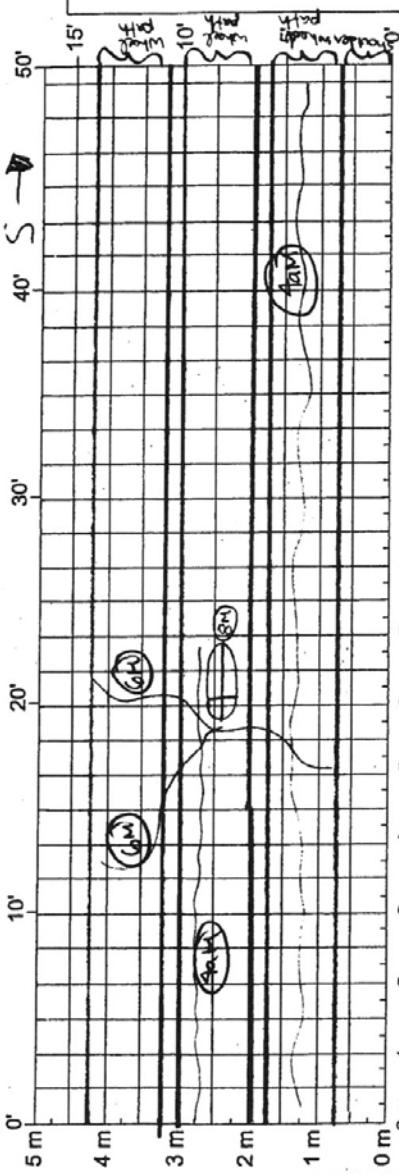
State Street 900 South to 3300 South, southbound. A majority of the damage is from 3000 South to 3300 South. The damage present consists mostly of moderate to high longitudinal cracking with moderate raveling & occassional potholes (small). In addition there is also moderate to high transverse cracking that is mostly present in wheel paths.

Reviewer: _____ Surveyors: OB

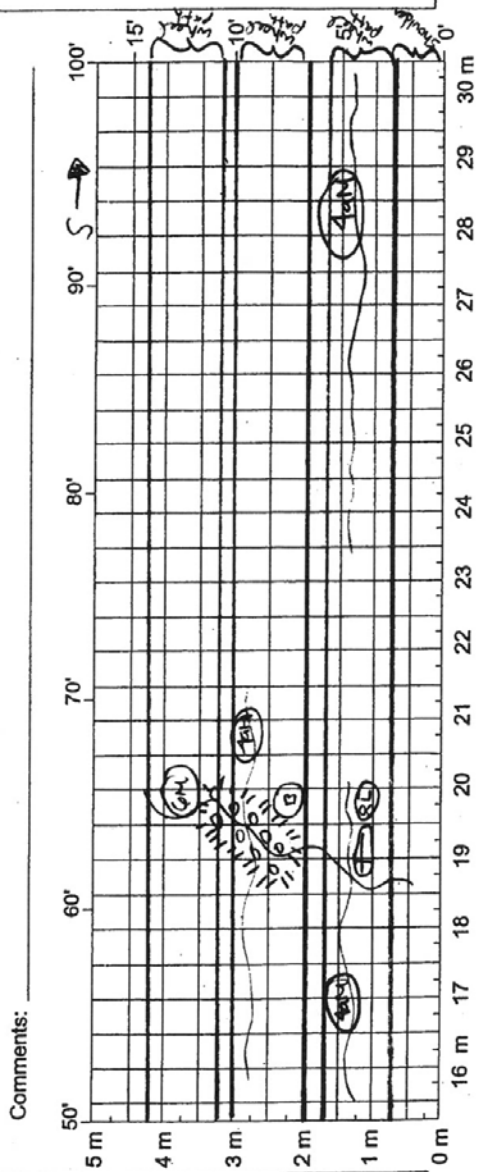
Date: _____ Date: 07/06/07

Pavement Temp:

Before _____ After _____



Comments: _____



Comments: _____

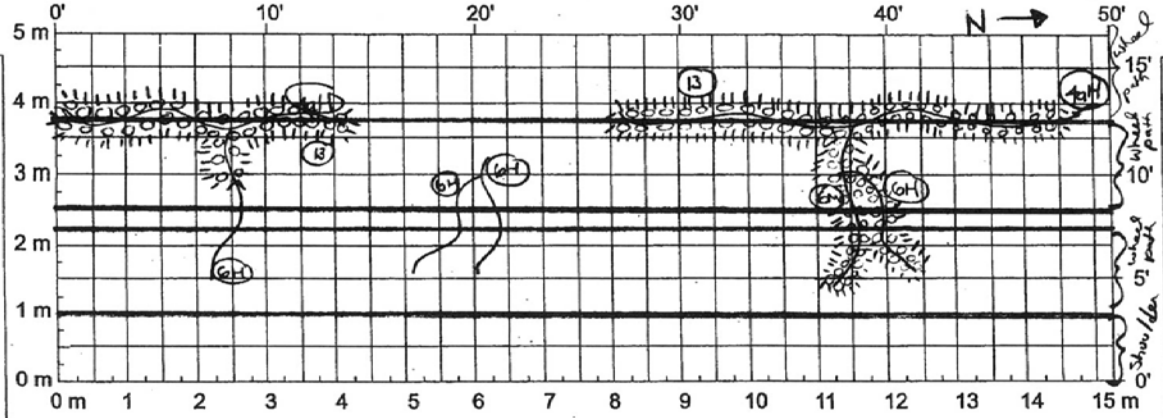
Section Summary

Reviewer: _____ Surveyors: CB Pavement Temp:

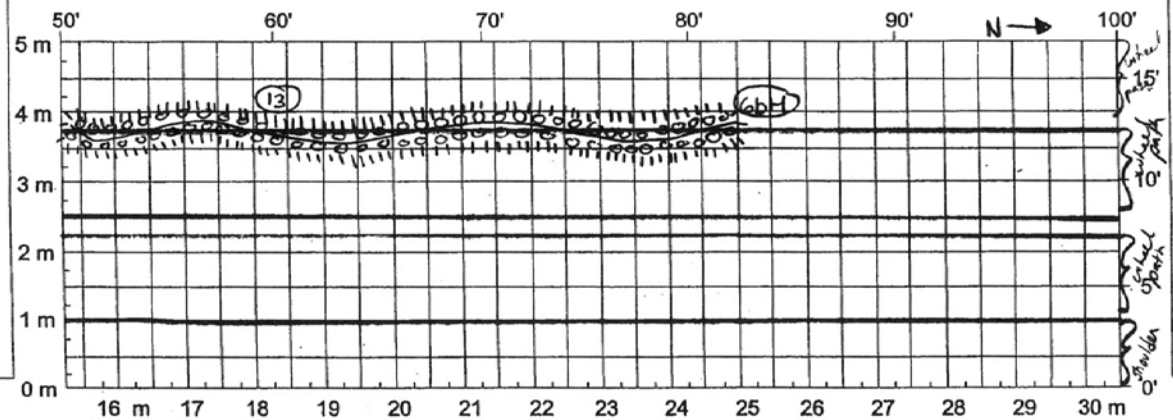
Date: _____ Date: 07/23/09 Before _____ After _____

Section Summary

108 Appendix A



Comments: Foothill Blvd from 1300 East to I-80 North Bound



Comments: _____

Sheet Summary

Foothill Blvd from 1300 East to I-80, North Bound. A majority of the damage appears to be originating from the overlap of the seams. The damage is mostly moderate to severe longitudinal cracking with raveling present. There is also sporadic low-moderate transverse cracking between wheelpaths. The paint does not seem to be causing an isolated effects.

Reviewer: _____ Surveyors: CB

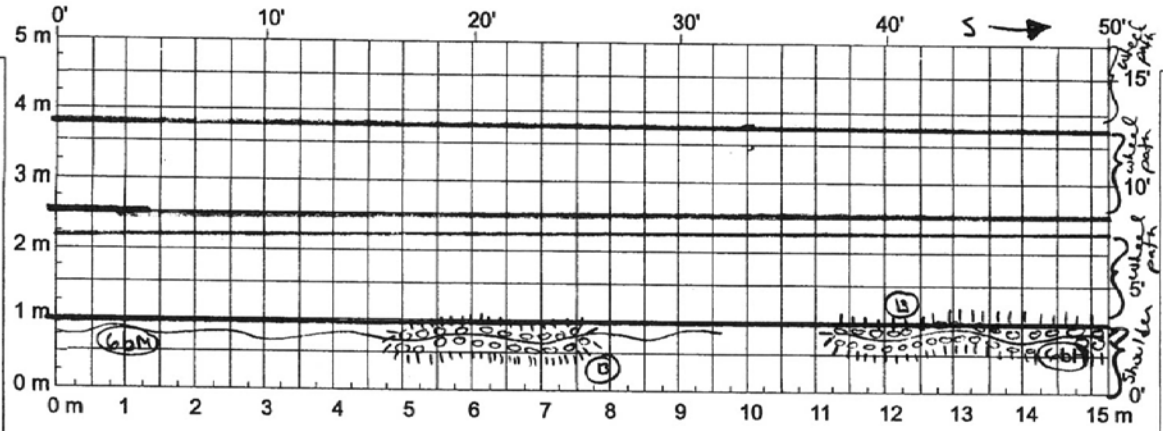
Date: _____ Date: 7/23/09

Pavement Temp:

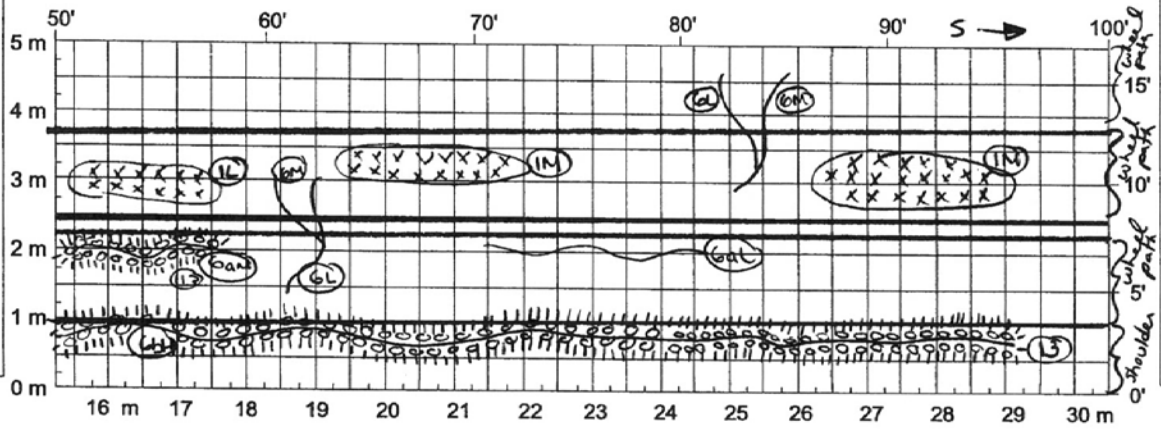
Before_____ After_____

Section Summary

108 Appendix A



Comments: Foothill Blvd from 1300 East to I-80 South Bound



Comments: _____

Sheet Summary

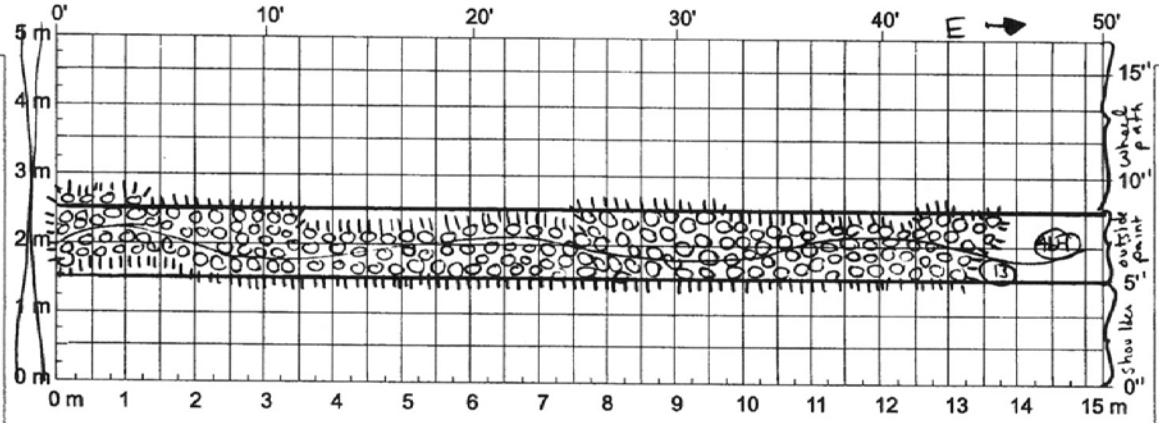
Foothill Blvd from 1300 East to I-80, South Bound. A majority of the damage is moderate-severe longitudinal cracking with raveling present. The longitudinal cracks appear mostly isolated to seam overlaps. There is also occasional/sporadic low-medium fatigue cracking in the outside wheel path. ~~There~~ All lanes of travel have occasional low-moderate transverse cracking from wheel path to wheel path. The point does not seem to have any isolated effects.

Reviewer: _____ Surveyors: _____ Pavement Temp:

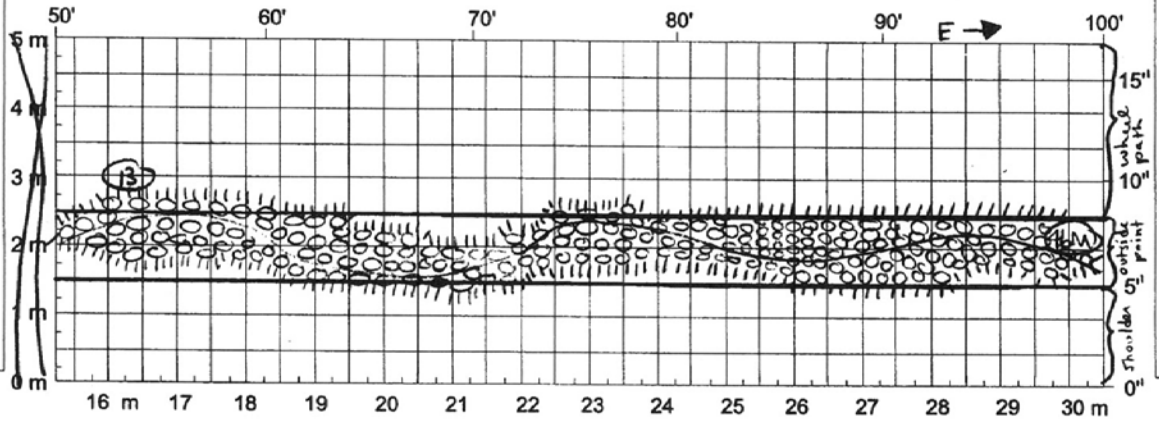
Date: _____ Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: 6200 South from Wasatch Blvd to the Mouth of Big Cottonwood Canyon East Bound



Comments: _____

Sheet Summary

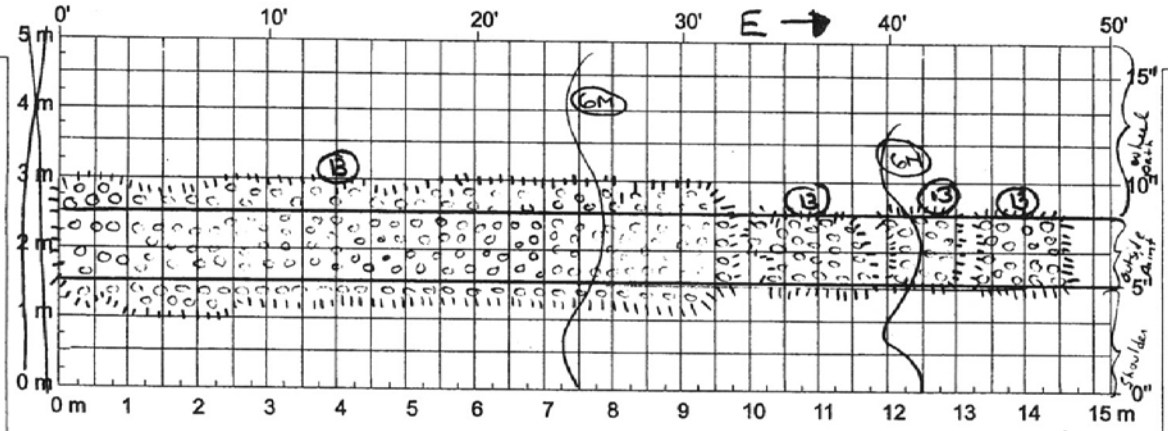
6200 South from Wasatch Blvd to mouth of Big Cottonwood Canyon, East Bound. The paint seems to be the main cause of failure. almost all the outside paint has significant raveling & moderate - high longitudinal cracking. There is also normal wear to the road. However, all the paint, outside lines & lane markers show significant isolated ravel & moderate to high longitudinal cracking.

Reviewer: _____ Surveyors: _____ Pavement Temp:

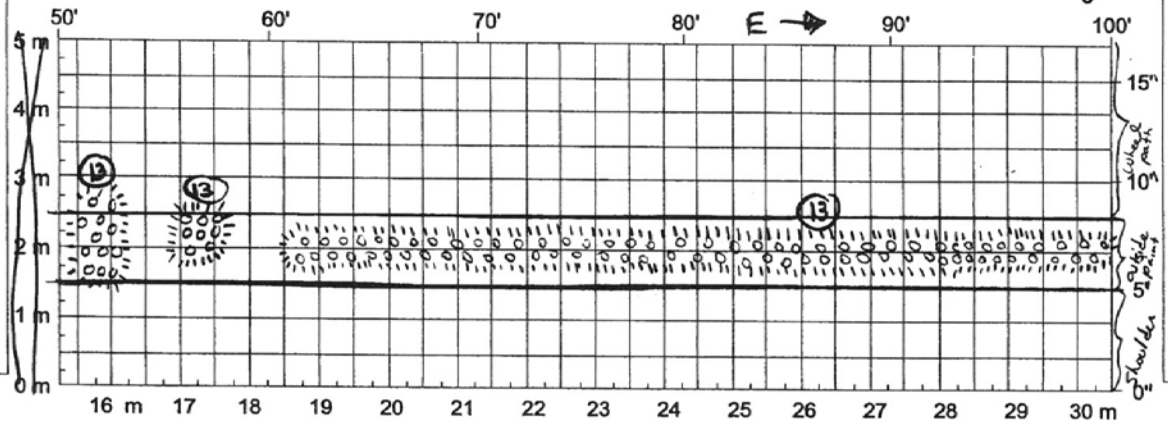
Date: 5/26/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: East Bound 9400 South 2200 East to mouth of Little Cottonwood Canyon



Comments: East Bound 9400 South 2200 East to Little Cottonwood Canyon

Sheet Summary

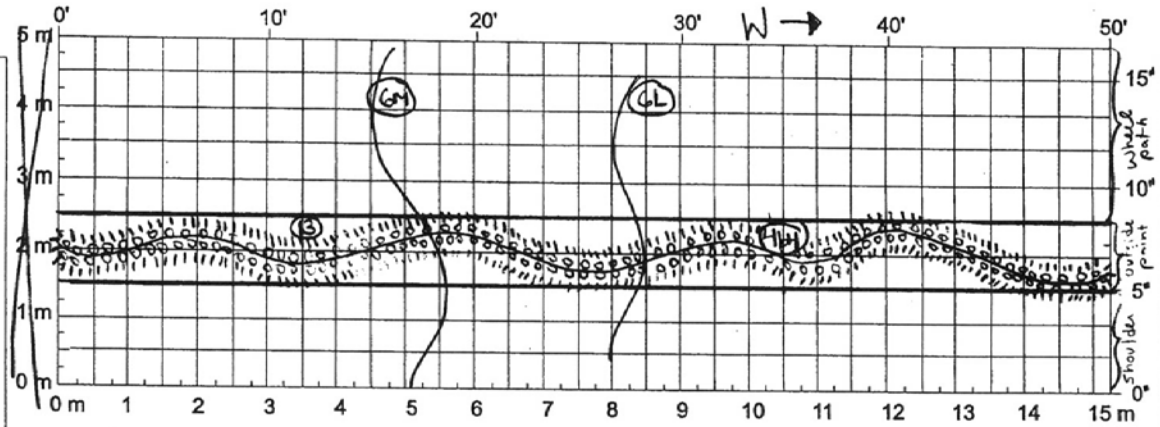
9400 South from 2200 East to mouth of Little Cottonwood Canyon East Bound. Majority of damage is due to raveling & is isolated to the point. In addition there is also a fair amount of moderate-severe transverse cracking, no isolated to point. Paint is almost non-existant except where patches have been placed.

Reviewer: _____ Surveyors: _____ Pavement Temp:

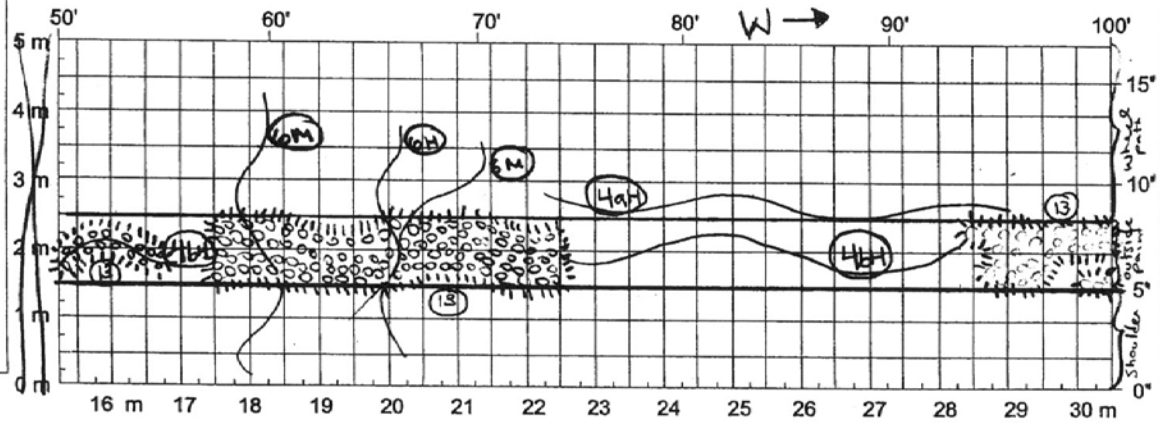
Date: 5/26/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: West Bound



Comments: West Bound

Sheet Summary

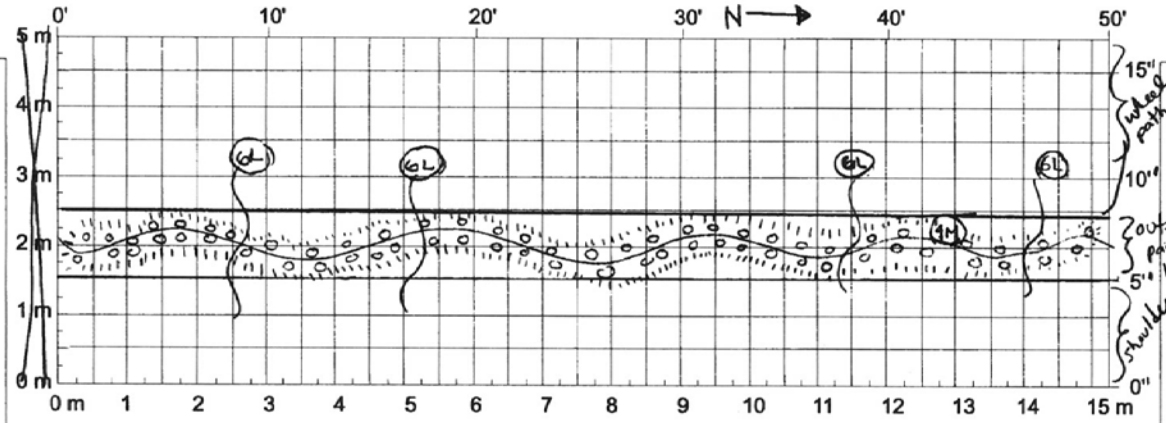
9400 South from 2200 East to mouth of Little Cottonwood Canyon West Bound. Majority of the damage is raveling a moderate-severe longitudinal cracking, both appear isolated to the paint. In addition there is a fair amount of moderate to severe transverse cracking that does not appear isolated to the paint. Paint is wearing faded a non existant in some areas

Reviewer: _____ Surveyors: _____ Pavement Temp:

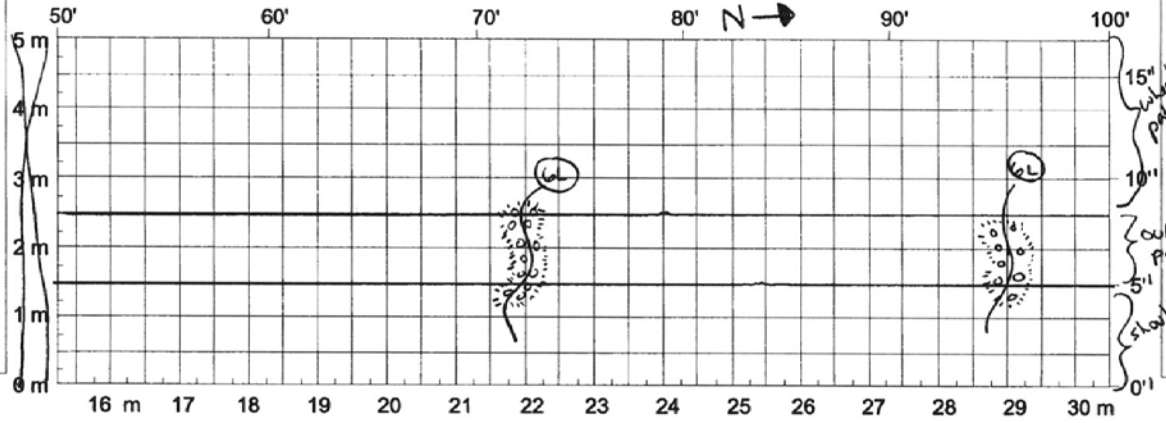
Date: 6/3/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: SR 224 North Bound



Comments: SR 224 North Bound

Sheet Summary

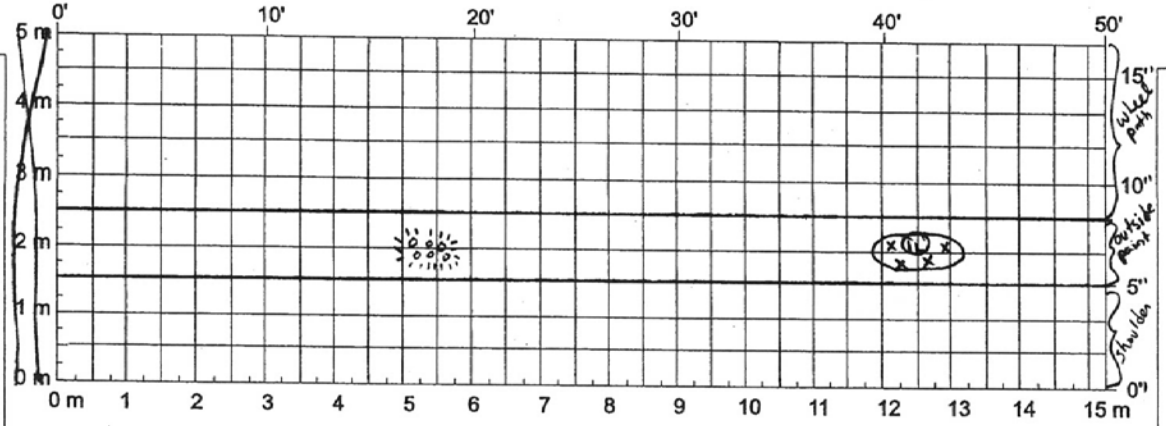
SR 224 from Bear Hollow Dr to Junction SR 248 in Park City North Bound. A majority of the distress appears to be where the seam overlap. At the seam overlap there is moderate-severe longitudinal cracking & raveling. The paint shows minor distress & fading with occassional longitudinal & transverse cracking in addition there is occassional sections with fatigue cracking & raveling.

Reviewer: _____ Surveyors: _____ Pavement Temp:

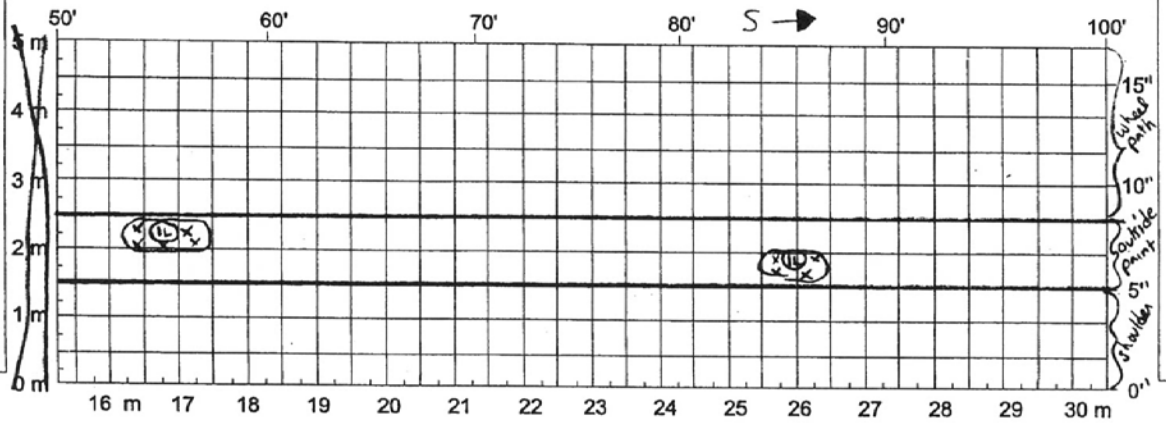
Date: 6/3/09 Date: _____ Before_____ After_____

Section Summary

108 Appendix A



Comments: SR 224 South Bound



Comments: SR 224 South Bound

Sheet Summary

SR 224 from Bear Hollow Dr to Jeremiah of SR 248 in Park City South Bound. A majority of the damage is in the wheel path & consists of moderate-severe longitudinal cracking & raveling. The damage seems to be due to the overlap of the seams. The paint shows normal wear & the distress is due primarily to low severity fatigue cracking & some small patches of raveling.

Reviewer: _____ Surveyors: CB

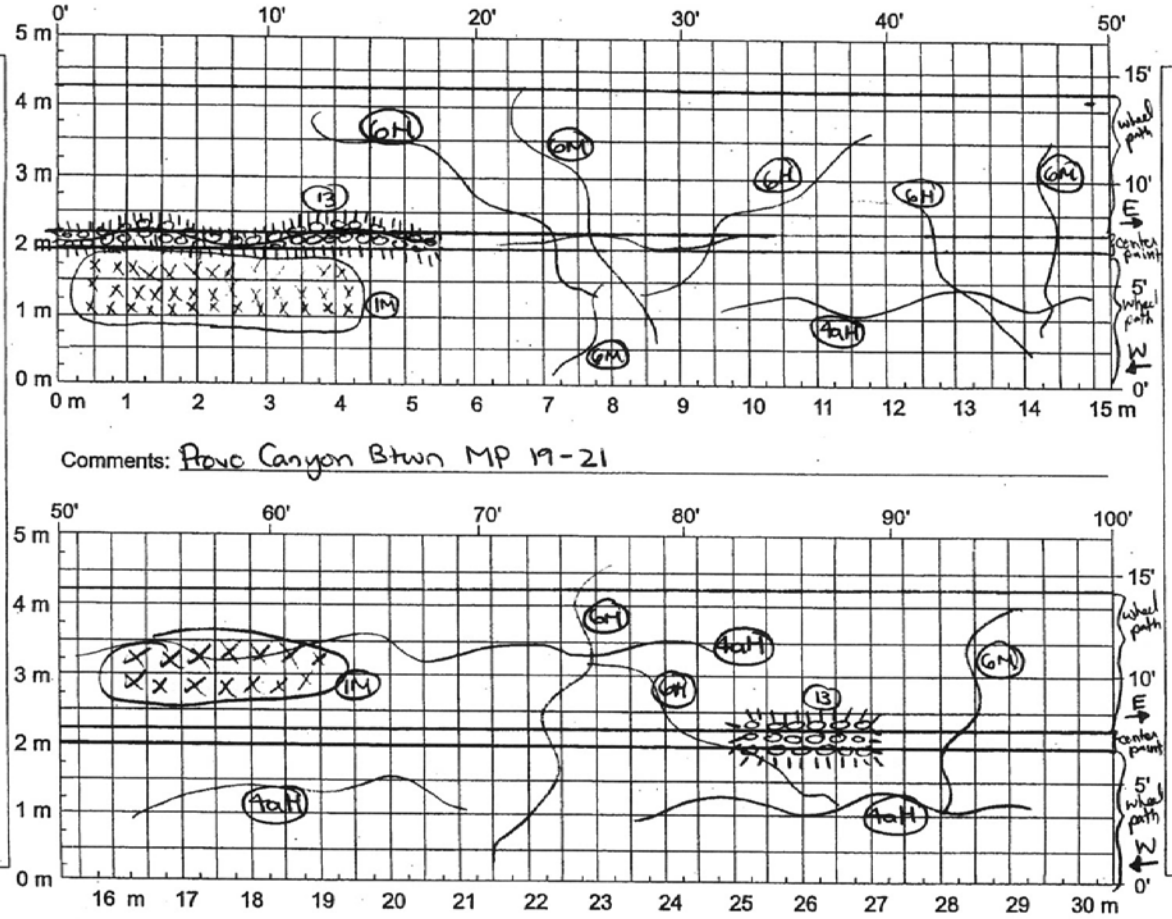
Date: _____ Date: 7/30/09

Pavement Temp:

Before_____ After_____

Section Summary

108 Appendix A



Comments: _____

Sheet Summary

Provo Canyon btwn MP 19-21. Road is one lane in each direction. A majority of the damage ~~to~~ consists of moderate-high longitudinal & transverse cracking. In addition there is significant moderate fatigue cracking. Raveling is also present & appears to be the worst where paint is present. The damage is present across the entire roadway. Raveling is isolated just to the old paint where the road was widened & ~~paved~~ paved over.